

IEM's AI Modeling: Short-term COVID-19 Projections

Date: 2/16/21

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.

AI-based Model Background

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 2/16/21 9 a.m.

Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.

Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.

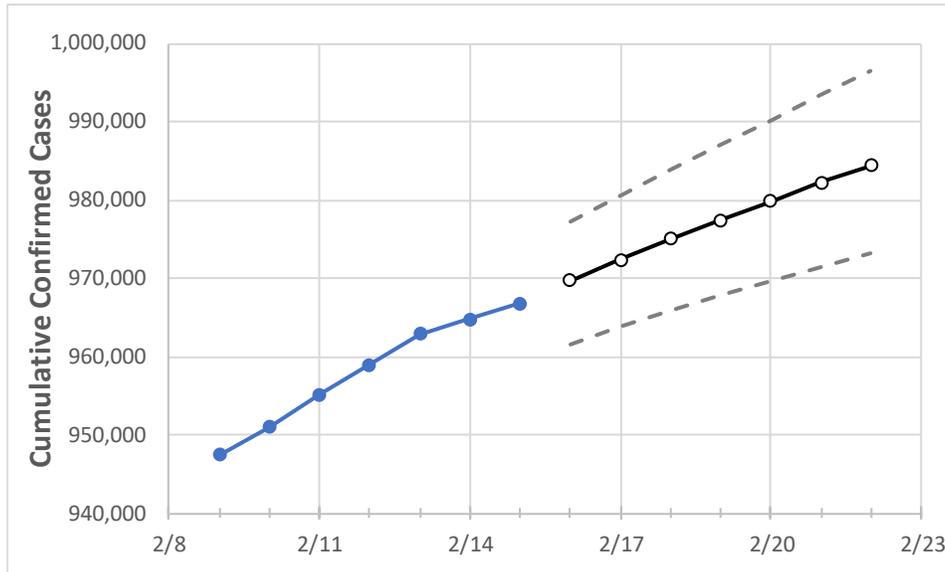
IEM's Modeling Lead

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

Georgia State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22
Georgia	958,985	962,808	964,737	966,807	969,647	972,328	974,977	977,473	979,884	982,208	984,453

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

Georgia Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22
Bartow	12,074	12,129	12,166	12,190	12,242	12,292	12,341	12,388	12,434	12,478	12,521
Carroll	10,138	10,166	10,185	10,209	10,240	10,270	10,298	10,328	10,355	10,381	10,406
Cherokee	25,577	25,670	25,714	25,812	25,894	25,972	26,046	26,118	26,187	26,253	26,318
Clarke	13,629	13,671	13,701	13,733	13,769	13,803	13,837	13,869	13,901	13,931	13,959
Clayton	21,945	22,025	22,068	22,127	22,273	22,411	22,545	22,681	22,825	22,956	23,091
Cobb	66,209	66,498	66,632	66,805	67,006	67,199	67,380	67,552	67,721	67,883	68,039
DeKalb	54,173	54,377	54,510	54,603	54,772	54,937	55,097	55,249	55,398	55,540	55,681
Dougherty	6,876	6,904	6,908	6,916	6,931	6,945	6,959	6,972	6,985	6,997	7,009
Douglas	12,675	12,745	12,794	12,832	12,890	12,946	13,002	13,055	13,106	13,158	13,208
Fulton	81,334	81,670	81,871	82,063	82,293	82,515	82,725	82,927	83,119	83,304	83,486
Gwinnett	87,985	88,324	88,564	88,737	88,980	89,211	89,440	89,650	89,850	90,037	90,220
Hall	24,749	24,821	24,855	24,890	24,931	24,972	25,009	25,049	25,086	25,119	25,149
Henry	20,338	20,428	20,481	20,547	20,616	20,683	20,750	20,813	20,872	20,929	20,984
Lee	2,513	2,519	2,520	2,520	2,527	2,533	2,540	2,546	2,551	2,557	2,562

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- **Beds:** For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.
- **ICU:** The CDC report found that 24% of hospitalized cases require ICU care.
- **Ventilators:** Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.

Georgia Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	2/12	2/13	2/14	2/15	2/17				2/19				2/21			
Bartow	12,074	12,129	12,166	12,190	12,292	(2,458)	[590]	{295}	12,388	(2,478)	[595]	{297}	12,478	(2,496)	[599]	{299}
Carroll	10,138	10,166	10,185	10,209	10,270	(2,054)	[493]	{246}	10,328	(2,066)	[496]	{248}	10,381	(2,076)	[498]	{249}
Cherokee	25,577	25,670	25,714	25,812	25,972	(5,194)	[1,247]	{623}	26,118	(5,224)	[1,254]	{627}	26,253	(5,251)	[1,260]	{630}
Clarke	13,629	13,671	13,701	13,733	13,803	(2,761)	[663]	{331}	13,869	(2,774)	[666]	{333}	13,931	(2,786)	[669]	{334}
Clayton	21,945	22,025	22,068	22,127	22,411	(4,482)	[1,076]	{538}	22,681	(4,536)	[1,089]	{544}	22,956	(4,591)	[1,102]	{551}
Cobb	66,209	66,498	66,632	66,805	67,199	(13,440)	[3,226]	{1,613}	67,552	(13,510)	[3,242]	{1,621}	67,883	(13,577)	[3,258]	{1,629}
DeKalb	54,173	54,377	54,510	54,603	54,937	(10,987)	[2,637]	{1,318}	55,249	(11,050)	[2,652]	{1,326}	55,540	(11,108)	[2,666]	{1,333}
Dougherty	6,876	6,904	6,908	6,916	6,945	(1,389)	[333]	{167}	6,972	(1,394)	[335]	{167}	6,997	(1,399)	[336]	{168}
Douglas	12,675	12,745	12,794	12,832	12,946	(2,589)	[621]	{311}	13,055	(2,611)	[627]	{313}	13,158	(2,632)	[632]	{316}
Fulton	81,334	81,670	81,871	82,063	82,515	(16,503)	[3,961]	{1,980}	82,927	(16,585)	[3,980]	{1,990}	83,304	(16,661)	[3,999]	{1,999}
Gwinnett	87,985	88,324	88,564	88,737	89,211	(17,842)	[4,282]	{2,141}	89,650	(17,930)	[4,303]	{2,152}	90,037	(18,007)	[4,322]	{2,161}
Hall	24,749	24,821	24,855	24,890	24,972	(4,994)	[1,199]	{599}	25,049	(5,010)	[1,202]	{601}	25,119	(5,024)	[1,206]	{603}
Henry	20,338	20,428	20,481	20,547	20,683	(4,137)	[993]	{496}	20,813	(4,163)	[999]	{500}	20,929	(4,186)	[1,005]	{502}
Lee	2,513	2,519	2,520	2,520	2,533	(507)	[122]	{61}	2,546	(509)	[122]	{61}	2,557	(511)	[123]	{61}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.